Synopsis of the Research Topic

Entitled.

'BIRDS AND THEIR CONSERVATION STATUS AT NANDUR MADHMESHWAR BIRD SANCTUARY NEAR NASHIK, INDIA'

Submitted for the

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Under

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1. INTRODUCTION

Nandur Madhmeshwar has been declared as Bird sanctuary (NAMBS) in 1986 by Government of Maharashtra State Department of Forest and Wild Life. Since from establishment of this water body in British period in 1907-1913 as a stone pickup wear for drinking water source to nearby 12 villages. It is constructed across the main river Godavari at confluence with its tributary river kadva. Later on in 1950 it had been rejuvenated as Nandur Madhmeshwar Reservoir and irrigation project by Govt. of Maharashtra. The sanctuary has three parts or components the reservoir and its back water area, downstream rocky area around Madhmeshwar temple and a patch of 14 ha. thick forest in downstream region to right outlet canal. The area of sanctuary is 19.6 km2. In the sanctuary there is continuous deposition of silt in the reservior and as time progressed it has established in to a wetland. It is very difficult area for sampling of Macrophytes, Macro Invertebrates and fishes due to heavy deposition of silt but as a basic taxonomic research work we will use first time the drone camera to reach the inaccessible area of this sanctuary to determine the biodiversity. Therefore photographic data will be available based on that the sampling transects can be fixed and sampling can be well planned. It will be first attempt through this project as a basic study on taxonomy of resources for the birds at this sanctuary. We are hopeful that this research will be possible due to our vast experience to work in the remotes during ecological studies and birding trips in Maharashtra State.

2. REVIEW OF LITERATURE AND DEVELOPMENT IN THE SUBJECT

(Privious workdone in the relevant area)

Nandur Madhmeshwar Bird Sanctuary (NMBS) near Niphad, district Nasik, Maharashtra State established as one of the unique natural habitat for local resident and migratory species over a period of one hundred years. Wetlands, small atolls,

marshy lands, trees, agriculture land around and a small patch of forest provides multiple habitat conditions for the birds especially water birds. During this study 105 species belongs to 14 Orders and 40 Families were recorded in winter season, (Chavan et.al.) , 2018, out of that the distribution and characteristics was 64 (60.9%) migratory, 41 (39.0%) Resident, 04 (3.8%) Near Threatened, 6 (5.17%) Abundant, 36 (34.2%) Occsional, 43 (40.9%) Common, 20 (19.0%) Rare. Winter migratory species were 16 (15.2%). Maximum number was of different duck species (Ansariformes) with species diversity 14 (14.3%). Winter season is population and diversity rich period for the occurrence of birds here. It is nearly pollution free zone for the birds and protected under the Department of Forest and Wild life, Government of Maharashtra.

(Wagh et. al., 2014) Reported 72 species of waterbirds at the Nandur Madhmeshwar wetland, from which 38 species are winter migrant, 6 species are near threatened (NT), 2 species are biome restricted and 3 species are listed in of CITES globally. All these findings highlight the importance of the Nandur Madhmeshwar wetland as an important roosting and wintering ground for waterbirds. The study reports 72 species of waterbirds belonging to 15 families. These 72 species use different habitats in different seasons, but broadly the 'fourth order of habitat' (i.e. actual place where birds procure food) is identified and this includes Open Water (OW), Emergent Vegetation (EV), Mudflat (MF), Agriculture Land (AL) and Natural and Artificial Islands (NAI). (Wagh et.al. ,2014)

(Kumar et.al.2010) Described the bird community of Shingba Rhododendron sanctuary, a high altitude protected area (> 3200 m) and an Important Bird Area (IBA) in Sikkim in the Eastern Himalaya, India. Altogether 332 points were sampled using a point count method. A total of 2545 birds belonging to 100 species and 22 families were recorded, including three new records for Sikkim. Non-parametric estimators Jackknife 1 and Jackknife 2 estimated 112 and 110 species, respectively. The observed species combined with previous records yielded 114 total species of birds in the sanctuary. Bird species richness in Shingba is higher compared to other parts of the Himalaya at similar elevations. Bird species richness and abundance showed significant variation among seasons with a

peak during monsoon. Species abundance data followed a truncated log normal distribution, indicative of a diverse community. Due to heavy tourist influx, the sanctuary is subjected to various threats. (Kumar et.al.2010)

The concept of forest and wildlife conservation is very old to India. Indian culture and literature teach nonviolence and respect for even lovely animal forms. Wildlife is a general term for life in ecosystem, deserts, rain-forests, plains and other areas including the most built up urban sites – all have distinct form of wildlife.There are 12 countries in the world, which are rich in biodiversity and are called "Megadiversity areas". India is ranked as sixth mega diversity country in the world. Its immense biological diversity represents about 7% of the world's flora and six and half of the World's fauna. There are about 1225 species of birds in India. Out of these, 78 species of birds are considered as threatened. India has five Heritage sites and six Ramsar sites. Amongst the five heritage sites one is present in Rajasthan – The Keoladeo Ghana National Park. The Keoladeo National Park and Sambhar Lake both are Ramsar sites of Rajasthan.Rajasthan with an area of 34.2 million ha, which constitutes 10.41% of the land area of the country, is one of the largest states of India in terms of area. Almost 60% of the geographical area of Rajasthan is desert but in spite of this about 510 species of birds found in the state (Grimmett and Inskipp, 2003). There are 02 National Parks and 25 Wildlife Sanctuaries in Rajasthan. Keoladeo National Park is famous for its avifauna and is the only place in the country where the Siberian Crane used to visit during its winter migration.

Udaipur Wildlife Division includes four sanctuaries viz. Kumbhalgarh Wildlife Sanctuary, Kumbhalgarh, Jaisamand Wildlife Sanctuary, Jaisamand, Fulwari ki Nal Wildlife Sanctuary, Kotda and Sajjangarh Wildlife Sanctuary, Udaipur. Amongst these, the Sajjangarh Wildlife Sanctuary is the smallest wildlife sanctuary of the largest state of the country. It covers only 5.19 km2 area. Udaipur has eight Important Bird Area sites (Islam and Rahmani, 2004). Important Bird area (IBA) are sites particularly important for bird conservation because they regularly hold significant population of one or more globally or regionally threatened endemic or congregator bird species or highly representative bird assemblages. Birds form important bio-indicators of the general health of any

ecosystem. Habitat degradation is today a major threat for the extermination of avian species. The conservation and management of threatened and endangered species is a tremendous challenge. (Dr.Karnika Jani 2009 Phd)

(Praveen et. al., 2016) Presented definitive Checklist of Birds of India ('The India Checklist') in a modern taxonomy. We have reviewed all the past records of bird species from within the political boundaries of the Republic of India and have included only those species whose occurrence within the country is well corroborated. In this process, we follow *'The Howard and Moore Complete Checklist of the Birds of the World'* (4th Edition) for taxonomy and species sequence. In total, the India Checklist acknowledges inclusion of 1263 species of birds out of which 61 (4.8%) are endemic to India. Taxonomically, it covers 23 orders, 107 families, and 498 genera. We hope that the India Checklist—a systematic, peer-reviewed baseline data for the country's avifauna—will standardise the taxonomy, and nomenclature, of Indian birds and will streamline communications in Indian ornithology. We also plan to regularly update the India Checklist online, which will be freely available to all users.

(Chavhan et.al. 2014) Studied Chaprala Wildlife Sanctuary is home to a variety of wild animals including a few endangered species and is surrounded by Pranhita River. 76 species of avian-fauna recorded in Chaprala Wildlife Sanctuary and of which as many as three bird species are of endangered status. The field survey was made to assess the forest for the avian fauna by conducting daily observations. Total 76 birds' species belonging 39 families were recorded. Accipitridae is the dominating family of birds they found here. The study was carried out from December, 2011 to December, 2012 at the interval of ten days.

3. OBJECTIVES/PROPOSED HYPOTHESIS

1. Assessment of avian diversity by applying population indices, IUCN data status and systematics.

2. Taxonomy of Macro- Invertebrates and fish species that act as food for migratory birds that visit regularly and inhabit for variable durations in the reservoirs of NMBS.

3. Taxonomy, Species diversity and richness of freshwater Macrophytes as an important flora to fulfill the needs of migratory birds and waders for food, nesting and shelter and breeding ground.

4. Taxonomy, diversity, richness and population dynamics of water-bird species and water birds of conservational importance in the selected study area of NMBS.

5. Capralogical analysis of fecal wastes from roosting grow of water birds and waders to determine the food material they consumed.

6. To determine the interaction for habitat use, competition for food and breeding grounds, predation and brood parasitism between local birds and migratory bird species in to the selected study area.

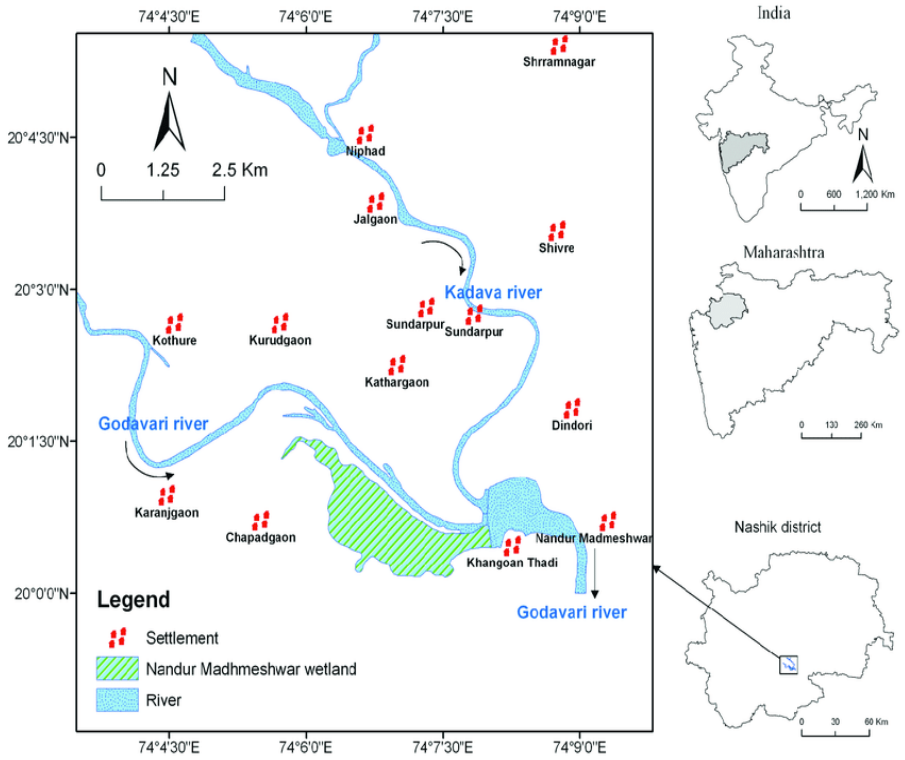
7. To determine the type and intensity of anthropogenic activity pressures altering the habitat condition and biota related to needs of migratory bird species.

8. To produce the primary dada base on taxonomy of Macro-Invertebrates, Macro-phytes and fishes for migratory bird species from the study area.

STUDY AREA.

(Reported by Chavan et.al.,2018) Nandur Madhmeshwar Bird Sanctuary is named after village Nandur located in the area and name Madhmeshwar is after the God Shiva, a temple around 250 years old construction that located in downstream rocky area of reservoir. It is also a pilgrimage centre for Mahanubhav Pantha worshipers. Due to draught and famine situation in the period of British Indian Governance, the British had built a stone pickup wear in year 1907-1913 on the confluence of two rivers the main river Godavari and its tributary Kadva. Later on in year 1950 it had been rejuvenated and reconstructed as Nandur Madhmeshwar Project. Nandur Madhmeshwar Bird Sanctuary (NMBS) located 200 00’ 43’ N and 740 06’ 24’ E, 12 Km. SE to Niphad town in Nasik district of Maharashtra State. The sanctuary area is connected to Niphad by road from two routes one is via Shivraphata-Nandur-Khangaon (Thadi) and another route is Niphad to Chapdgaon. Chapadgaon village is located near backwater of the reservoir (NMBS). The Village council of Chapadgaon and Department of Forest and Wildlife jointly

developed a observation centre near Chapadgaon. The entry fees in to the sanctuary at this centre was Rs. 60.00 (INR), Camera charges INR 100 and on rent the binocular to watch the birds was also available. In the periphery of water body five towers of 20-25 ft. height are constructed to watch the birds and for photography. Due to thick fringe of Typha anguestifolia a weed around the wetland area of reservoir, the distance between observers or bird watchers and bird habitat is 20-500 meters. Hence practically without binoculars or an ultra zoom camera it is difficult to identify the bird species. Hence the scene for a common man without any tool for observation will be a crowd of birds and their activities in long distance area. There is a facility of eco-friendly rooms to stay overnight, food, coffee-tea and a small recreational garden centre for the tourists and bird watchers at Chapadgaon Forest Centre. In the downstream of the reservoir there is a guest house under the control of State Forest Department. Two rooms for few days stay on rent charges INR 500/24 hrs/02 person are available. Online booking facility was not available, it was available on spot booking if vacant. For the students during their stay for study tour a common hall for 20-30 students was available without bed. At the same guest house the State Forest Department has also developed a Centre for Nature Interpretation (CNI). At CNI to educate the common man on avian diversity and bird life the information is displayed in the form of charts and digital photo boards. A documentary on species diversity of birds and their activities in the reservoir of NMBC was also shown on digital TV screen. In various galleries of CNI the models are displayed about types of eggs, feathers, nest types, types of beak and foot, evolution of birds and some important species of birds. For common man and students it is very informative. Similarly details on NMBS and the reservoir are also displayed on charts. In short NMBS is one of the best natural destination for tourists and naturalists for 1-2 days stay for birding and wild life study for all season especially good during winter. The place is well connected by tar roads from Niphad town, railway junction Manmad (MMR) and Airport at Aurangabad (AUX)



Map of Nandur-Madhmeshwar Wetland, Nasik District, Maharashtra.(Wagh et.al).

4. METHODOLOGY TO BE ADAPTED

This is very crucial and important section of the research that decide the success for achieving the objectives. Following standard methods and procedures will be used related to survey, collection, processing , preservation of biological materials for the taxonomic study to identify the species diversity of Macro-phytes, Macro-Invertebrates and fishes. All the form a complex network of community, micro niches in the reservoir, coastal shallow water of the reservoir as wetland and small bogs, islands in these selected sites.

1. **Taxonomy and population study of Birds:**

For avian diversity and distribution study the Line Transect and point count methods will be used. For species wise counting of Birds monthly census of Birds/Year/Sanctuary = 12 Census, for 02 years = 24 census. Count on foot and country boat survey method where count starts at 8.00 morning till completion of entire survey of reservoir area (Wetland International, 1997, 2006) will be used at sanctuaries. Slow walking the same route and stopping every 300 meters called

linear vantage point (LVP) will be used to count 01 Bird at a time and tally counter system. As the selected area has various micro niches other suitable methods like Boat Survey for inaccessible area, Drone camera will be used. DSLR camera with 600 mm lens for photography from suitable distance and platforms will be used Already there are platforms by bird watching at NMBS.

Digital auto-zoom lens point camera models like P900 Nikon will be fast to work for instant photo recording and video recording.

Species richness, species abundance, Shannon-Weiner Diversity will be measured and all possible diversity components of this sanctuaries statistically analyzed by applying two way ANOVA. The water birds and water species will be identified by following Ali (1986), Ali and Replay (1996), Grimmett and Inskipp (2011) and online avibases on taxonomy like www.internetbirds.org. cast-off feathers of the bird species will be collected for molecular taxonomy. Using indicator species analysis (Dufrene and Legendre, 1997) Water Bird community structure will be identified.

2. **Taxonomy of Macro Invertebrates:**

Macro Invertebrates community includes oligochaets (Tubifex worms and leeches) Crustaceans (Shrimps and Crabs) Mites and Insects (Larvae, pupae and adults) this mainly includes chironemid larve, mosquito larvae, Odonata and larvae of water beetles and others; Gastropods and Bivalves are other important component of the aquatic community. All these major Macro Invertebrates are food for migratory and local water birds and waders to form one of the feeding guild in the sanctuaries.

These components as active aquatic biota remain always in interaction forming various kinds of micro and macro food chains and food webs in the same habitat. To search these Macro Invertebrate species is a challenging task for the researchers.

The taxonomy of the Macro Invertebrates has not been studied in this habitat in relation to the need of Water Birds and Waders.

The specimens were collected from water bodies with the help of an aquatic net of mesh size less than 300µm. The large-sized specimens of macro-invertebrate were collected by handpicking. The collection was done randomly during sporadic visits to water bodies. The collected specimens were preserved in 70% alcohol. The specimen vials were labelled with respect to date of collection, locality, name of the collector, etc. (Pande et. al. 2020**,** Chawaka et. al., 2018)

Benthos Sampling will be done with the help of quadrant (15cm*15cm*10cm). All the sediment samples were washed separately through a 300µm nylon mesh by using water and then transferred to polythene bags and preserved in 5% formaldehyde containing Rose Bengal stain. In the laboratory, all the sediment samples were again washed on a 300µm sieve. All the fauna were sorted and preserved in plastic vials containing 5% formaldehyde. The fauna was enumerated and identified up to the group level under the stereo microscope. (Basu et.al. 2018).

3. **Taxonomy of Fishes:**

The fish samples will be collected from the fishermen in upstream and down stream area of the sanctuary from river Godavari and Kadwa. At each transect point area and by random sampling the fish samples will be collected and identified with the help of photo and on board measurement for morphometrics and meristics using digital veneer caliper scale. Micro-tissues samples, scales on the body will be collected for the molecular taxonomic study. Fish abundance by number of fish species/M will be calculated. Fish will be identified using (www.fishbase.org) by frose and pauly (2019), (Jayram 2010,2012)

4. Statistical analysis:

Variance and temporal variance (year wise) in all the variables of the components in selected habitats will be analyzed using SPSS V20 by ANOVA. The software is available on consultancy service based with minimum charges from the department of statistics of the same university where the research will be accepted.

5. IMPORTANCE OF THE STUDY/SOCIETY APPLICATION

- **International status**

Nandur Madhmeshwar is an established Bird Sanctuary in Maharashtra and has been observed as one of the Important Bird Area (IBA) in South East Asia Flyway route that has been established since last 50 years. The route has been used as stop spot for energy recharge and rest during migration of several waders and ducks from northern hemisphere to southern hemisphere. The annual migration occour due to cold and shortage of food. This indicates the importance of Nandur Madhmeshwar Bird Sanctuary for making successful migration to several birds. What kind of food these avifauna consume and to what extent they depend on the food resources available at this sanctuary will be investigated. This is a direct evidence of the selected problem with international avifaunal activity.

- **National status**

The selected problem in present investigation has not been worked out. Therefore the study has national importance.

Nandur Madhmeshwar Bird Sanctuary is established in the Godavari River basin near by the origin of River Godavari.

Except surface run off from agriculture in the form of pestiside and fertilizer, sewage and industrial effluents from Nashik city, sugarcane and other industrial west (winaries) from Niphad there are no major influx of pollutants. Due to less pollution there may be highly diverse benthick fauna and dependant Birds at this sanctuary.

At national level there are reports on avian diversity study at Nandur Madhmeshwar in the form of checklist of Birds (Chavan et. al., 2018).

- **Significance of the study**

The physiochemical and biological properties of the ecosystem always change with time therefore it is essential to monitor the ecosystem.

Nandur Madhmeshar is man made reservoir ecosystem later on it has been developed into the wetland ecosystem in the back water of Nandur Madhmeshwar

reservoir constructed 72 species of migratory, resident and transient migrant.(Wagh et. al. ,2014)

Annual monitoring of avifauna, macrophytes,plankton and macro- invertebrates which is food of the birds is essential to investigate.

Diversity of avifauna and the other biotic communities is essential to determine in this bird sanctuary and recently declared Ramsar wetland (2019) which is second in Maharashtra next to Lonar crater ecosystem, there is no data on the diversity of macro- invertebrates from this sanctuaries similarly the avian diversity and its annual population dynamics are not at studied.

The avian species diversity and their IUCN status dynamics also not known fully at this site. These are some important issues to determine through this study.

HYPOTHESIS OF THE STUDY AND POSSIBLE OUTCOME:

1) Current status of avian diversity will be determined.
2) Migratory species of birds and their dependence on this sanctuary for food nesting and reproduction will be investigated.
3) This study overall will be helpful for conservation of birds, microhabitates (niche) of this sanctuary.

6. PROPOSED WORK PLAN/FORMULATION AND STRUCTURE OF STUDY:

(Year wise plan of work and targets to be achieved)

1. The research duration is of three years from Year June-2021 to June. 2024.
2. First year –Review of literature and course work. Sampling at the study site for species diversity of Birds in various seasons. Local, migratory, division based on feeding guilds, IUCN based classification like threatened, Near Threatened, Endangered etc. Similarly the macro-invertebrates and macropohytes will be collected and identified using APHA (2008), Fresh water Biology, Edmondson (edi.) 2018.
3. Second year- field work and publication of research papers. along with observation of birds behaviour within the species and its community. After

collection of the macro-invertebrates samples will be analysis under the laboratory.

4. Third year- writing of thesis, Publication of data in the form of research papers. Continue the observation of birds to correlate with the macro-invertebrate. Thesis writing for the final submission.

7. REFERENCES:

1) Abdulali H. Checklist of Birds of Maharashtra, BNHS, Mumbai, 1981, 1-35.

2) Ali S, Repley SD. A Practical Guide to the birds of Indian sub-continent, 1983, 1-300.

3) Ali S. The Book of Indian Birds. BNHS, Mumbai, 1996, 1-354.

4) Avibase. The World Bird Database; 2017. (http://.www.avibase.org).

5) Balkhande JV, Bhowte CS, Kulkarni AN. Checklist of Birds of River Godavari, Dhangartakli near Purna, Dist. Parbhani, Maharashtra, Bionano Frontier, 2012, 5(2).

6) Balkhande JV, Bhowte CS, Kulkarni AN. Checklist of Birds of River Godavari, Dhangartakli near Purna, Dist. Parbhani, Maharashtra, Bionano Frontier, 2012, 5(2).

7) Bibby CJ, Burgess ND, Hill DA, Mustoe SH. Birds census techniques. London: Academic Press, 2000, 302.

8) Birdlife International. IUCN Rd List for birds, 2017. (http:// www.birdlife.org).

9) Buckland ST, Anderson DR, Burham KP, Laake JL, Borchers DL, Thomas L. Introduction to distance sampling, Oxford University Press, Oxford, 2001, 432

10) Buckland ST, Anderson DR, Burham KP, Laake JL. Estimation of density from line transect sampling of biological population, Wildlife Monograph. 1986; 72:1-202.

11) Chao A. Nonparametric estimation of the number of classes in a population, Scan. J Stat. 1984; 14:61-69.

12) Chavhan PR, Dhamni AA. Avian diversity in and aroundChaprala Wild Life Sanctuary District Gadchiroli, Maharashtra, India. International Journal of Fauna and Biological Studies 2014; 1 (6): 90-95.

13) Chavan Shivaji Prabhakar, Dilip Dudhmal. Population status, shift in food chain and behavioural ecology from isolated ponds of Godavari River basin in Nanded district, India. Science Research Reporter. 2016a; 6(1):50-57.

14) Chavan Shivaji, Dilip Dudhmal, Deepak Walke. Mud nests of Wire-tailed Swallow (Hirundo filifera): Biomarkers of ecological Niche in Godavari River Ecosystem, Nanded, Maharashtra State. Advances in Bioresearches. 2016b; 7(2):170-175

15) Das Sumit K, Debi P Sahooo, Nibedita dash, Hemanta K Sahu. Avifaunal diversity of Baisipalli Wild Life Sanctuary, Odisha, India. Indian BIRDS. 2013; 8(4):90-92.

16) Gaston AJ. Methods of estimating bird population. Journal of BNHS. 1973; 72(2):272-281

17) Gole, P. (2000) Survey of Birds of Bhimashankar Wildlife Sanctuary and formulation of Management guidelines for their protection. *Final Report.* A project sponsored by the Forest Department, Government of Maharashtra.

18) Islam ZU, Rahmani AR. Important Bird areas in India, Priority sites for conservation Network: Bombay Natural History Society and Bird Life International (UK), 2004.

19) Islam, M., & A. R. Rahmani (2004). Important Bird Areas in India – Priority Sites for Conservation, Bombay Natural History Scoeity

20) IUCN Red List of Birds. BirdLife International, 2018. (http:// www.birdlife.org).

21) Kasambe, R. & Khan, N. (2015): Checklist of birds of Karnala Bird Sanctuary, District Raigad, Maharashtra, Newsletter for Birdwatchers 55(2).

22) Kulkarni AN, Bhowte CS, Kanwate VS. Bird census in Nanded region (Maharashtra). Bioinfolet. 2006a; 3(3):173-178.

23) Kulkarni AN, Kanwate VS. Avian fauna of forest Jaldhara, Kinwat, Dist. Nanded, Maharashtra. Jr. of Aqua. Biol. 2010; 25(1):46-51.

24) Maharashtra, India. International Journal of Fauna and Biological Studies. 2014; 6:90-95.

25) Pande GS1, Gaikwad RB , Shelke PS , Wankhede C, Waghmare MS , Talmale SS , Patil SR (2020). A preliminary report on the diversity of selected higher macroinvertebrate groups of

some freshwater bodies from Western Maharashtra A preliminary report on the diversity of selected higher macroinvertebrate groups of some freshwater bodies from Western Maharashtra. International Journal of Entomology Research.

26) Prasad KK, Bagari RC, Bhargavi S. Avifaunal Diversity of Manjeera Wild Life Sanctuary, Andhra Pradesh, India, Jour of Threatened Taxa. 2014; 6(2):5464-5477

27) Praveen, J., Rajah, J. & Pittie A. (2016): The India Checklist: *Indian Birds*. 11. 5& 6.

28) Rajesh M Achegave, Shivaji P Chavan, Priyanka V Patil, Shashikant H Tarte. Nesting of Baya weaver (Ploceus philippinus) in S. R. T. M. University, Nanded and Fields along Asana River at Nanded, Maharashtra, India. Int. J. Curr. Res. Aca. Rev. 2016; 4(6):51-60.

29) Riyaz, A. (2000). Studies on bird community structure in Hastinapur Wildlife Sanctuary, UP., India - Using line transect method. MSc Dissertation. Department of Wildlife Sciences, Aligarh Muslim University, Aligarh, India, 30pp.

30) Sharda padghane, Shivaji Chavan, Dilip Dudhmal, Deepak Walke. Mollusc diversity and its role as food for crabs and water birds in Godavari River basin, Nanded (MS), India. Int. J. Advanced scientific and Technical Research. 2017; 2(7):149-161.

31) Shivaji Chavan, Dilip Dudhmal, Shrikrishna Hambarde, Kulkarni AN. Birds from Godavari River basin in

32) Tanveer, A. (2000). Studies on bird community structure in Hastinapur Wildlife Sanctuary, Uttar Pradesh, India - Using point count method. MSc Dissertation. Department of Wildlife Sciences, Aligarh Muslim University, Aligarh, India, 43pp

33) Wagh, G.A., Jane, N., Wadatkar, J.S. & Rawankar, A.S.(2015): Waders diversity in Amravati Region, Maharashtra, *Proc. Wetlands-Present status, Eco. & Cons*.3-9.

RESEARCH SCHOLAR

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RESEARCH GUIDE